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Technical Note No. 1

Profitable Grazing-Based Dairy Systems

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Acknowledgments

Numerous people have provided source information, as well as expert reviews and comments. Their contributions are acknowledged and very much appreciated. This publication is intended to support and encourage the start-up of grazing-based dairy farms across the Nation whether they are organic or “conventional.” With the interest in grazing-based dairies on the rise, this publication is timely. It is a helpful guidepost to those wanting provide their dairy cows fresh pasture for as long as their growing season permits. As an editor recently stated in a grazing magazine, pasturing dairy cows is conventional when we look at the long history of dairy farming here in the United States and the World. It has been a brief moment in history that we have confined dairy cows and hauled everything to them that they eat.

Technical editors:

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Introduction

This technical note provides background and general guidance on the concept of grazing-based dairy systems, defined as land management systems that seek to *optimize* dairy production through grazing. As a companion technical note to the Natural Resources Conservation Service sustainable agriculture tech note series, it focuses on associated economic, environmental, and social benefits.

Well-managed grazing-based dairies help protect soil, water, air, plant, and animal resources by maintaining dense vegetative cover on the soil, increasing soil organic matter, improving the distribution of nutrients on fields, and reducing the potential for odors, spills, or runoff from concentrated animal waste storage areas. Compared with traditional confinement dairies, grazing-based dairies harbor more wildlife, more diverse plant communities, and healthier cows with longer productive lives. In addition, grazing-based dairies often boost income by reducing feed, labor, equipment, and fuel costs. Less tractor time frequently increases leisure time or allows for expanded farmer enterprises. Grazing-based dairy systems also provide a lower-cost option to help some small family farms survive without expanding their business, or start dairying with less debt incurred.

This technical note has three parts. Part I defines grazing-based dairies and describes their ecological, social, and economic benefits. It may be of greatest interest to those wanting to know about the advantages and disadvantages of grazing-based dairy systems. Part II describes the considerations involved in developing or making the transition to a grazing-based dairy. It may be of greatest interest to those who have decided on grazing, but want more information on what is involved. Part III is a series of case studies from different parts of the country. Interest in individual case studies may depend on the geographic location of the individual reader.

Part I

Background

While dairy farming is undergoing rapid expansion in arid environments across the country, the overall number of dairies and dairy cows has decreased, but the number of cows per farm has increased. Dairy farm profits are increasingly affected by urban encroachment, rising land costs and taxes, and industry pressure to use the latest milk production technologies. Production per cow and total production have increased more rapidly than demand for milk, keeping pressure on dairy producers either to improve or to get out of the business. Nutrient management regulations to improve water quality are increasing the cost of manure handling. Recently, air quality constituents, such as odors and particulates, associated with confinement and manure storage facilities have come under more scrutiny, as well. Meanwhile, long-term average milk price trends have remained static, whereas short-term milk prices are unpredictable, often falling to unprofitable levels for several months during a production year.

As profitability of dairy farms declined in the 1980s and 1990s, it was common for managers to expand herd size, attempting to maintain or increase net income.

- During each grazing season, lactating animals obtain at least 50 percent of their forage intake through grazing. Meanwhile, dry cows and heifers obtain at least 90 percent of their forage intake through grazing.
- Water is provided to the herd in the paddock in which they are grazing or in the laneway near the paddock.
- Paddocks are sized every rotation cycle to provide enough on-offer forage for adequate livestock intake during their time on each paddock while keeping adequate forage residual to maintain stand vigor and desired species composition. A back fence prohibits access to just-grazed pad-

the herd for the length of the planned stay. However, pasture is generally harvested before maturity, when it is vegetative and very high quality. Pasture has no loss of dry matter by respiration and no shatter, leaf loss, or loss of quality by spoilage or rain damage that generally accompany perishable, stored forage production procedures despite efforts to reduce such losses.

Finally, pasture is harvested by livestock. Animals are the harvesting machines, but unlike mechanical machines they choose what and where they harvest and where they deposit animal wastes. These choices affect forage utilization and manure distribution. Cows shun urine and dung spots and unpalatable plants and plant parts. They often return the nutrients in manure to the pasture in a nonuniform pattern if shade, permanently placed water troughs, mineral feeders, or hay bunks are present that cause them to linger near those areas.

A unit of fenced land with productive soil that is managed to provide high quality forage for lactating dairy cows, replacement heifers, or dry cows as a significant portion of their diet throughout the pasture growing season.

Manure distribution in intensive dairy grazing management can vary in warm versus cool weather (White et al. 2001). However, a structured grazing and clipping system can cause animal grazing to mimic closely the uniformity achieved by mechanical harvest and nutrient application. Cows are also extremely efficient harvesters. They leave behind forage that they neither desire nor need. Typically, this includes more mature forage. Grazed forage is usually less mature than mechanically harvested forage. This selectivity cannot be achieved by machines that harvest the good and the bad above the cutter bar.

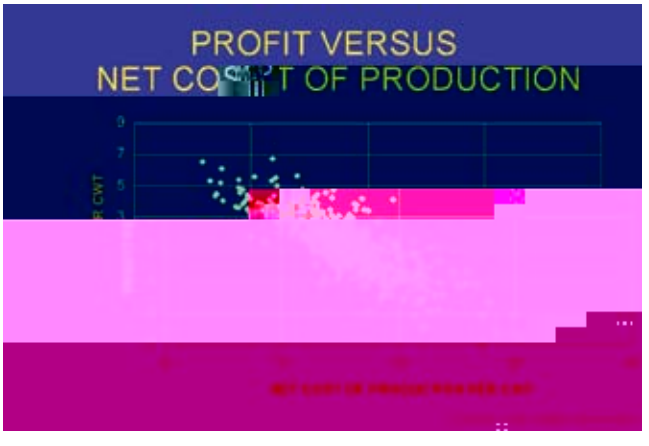
Grazing-based dairy systems require the simultaneous management of a forage production system, a livestock production system, and a forage harvest system. The grazing-based dairy replaces high input costs of a confinement dairy with the managerial skill of the grazier to ration high quality pasture well throughout the grazing season. Understanding forage plant growth

producers with high rolling herd averages to go broke (Smith et al. 2002). A much better indicator is net farm income from operations (NFIFO) per cow or net cost of production per hundred-weight (CWT) of milk produced (fig. 3).

Many grazing-based systems intentionally forgo maximum milk production to meet family and lifestyle goals. Even so, cases exist where grazing-based dairy herds exceed 20,000 pounds of milk per cow per year, and some individual producers routinely report herd averages of 24,000 to 26,000 pounds of milk per cow per year. Some grazing-based dairy herds are still quite profitable producing 15,000 pounds of milk per cow per year or less (Kriegel 2000). As shown in figure 3, dairies with the lowest cost of production generate the highest net profits. Using grazing-based systems can significantly reduce production costs.

The greatest obstacle to the adoption and use of grazing as the central part of a production system for dairy cows may be custom and culture. Over the past 40 years, most dairy producers abandoned grazing-based systems for confinement-based systems to maximize milk production. As a result, confinement dairying is the only system many producers know. In spite of high debts and low profit margins resulting from increased mechanization and facilities costs and low milk prices, farmers are reluctant to try a grazing system and learn how to operate it. A mistake farmers sometimes make is to prolong the decision to switch to a grazing-based system until their debt margin is too great to be easily overcome, even with improved profitability.

Profit as a function of net cost of production



Other obstacles, real or imagined, include:

- Physical location of the barn or milking facility in relationship to the cropland that could be used for improved pasture. For example, it is too far for the animals to walk, or there are intervening physical barriers such as roads or watercourses.
- Good management skills are necessary, and new skills are needed. This requires the ability to adapt and the desire to learn.
- The concept of "optimum" milk yield versus "maximum" milk yield can be a tough sell given the dairy industry's tendency to equate high milk yield producers as the most successful dairy managers.
- Former confinement herds placed on pasture must become adapted both genetically and behaviorally to grazing. The genetics takes time.
- The kind of necessary equipment changes, resulting (sometimes) in the misconception that more equipment is needed and older equipment is being underused.
- Balancing rations with grazing selectivity and changing pasture quality throughout the season requires more attention to both the pasture and the animal.
- Herd size is too large for the land base. There is not enough available or potential pastureland to support the herd for the full length of the grazing season.
- Features or characteristics of the climate or land base (rough, broken terrain, wet soils, heat and humidity, periods of drought, or prolonged wet or cold weather) prevent efficient pasturing of dairy cows.
- A misconception persists that pastures are low yielding and, therefore, inferior to row and hay crops as a land use. This often results in managers relegating pastures to marginal lands and not improving them nor managing the grazing of them, thus ensuring poor yields and risking long-term sustainability.
- Forage base is not suitable in the short term to meet the quality or quantity requirements for dairy production. Fields that have been row-cropped or in hay production for many years take time and management to become densely grassed, highly productive pastures.
- Some or all paddocks lack a water supply. Developing a water system requires up-front capital, but some Farm Bill programs may provide cost-share assistance for water development.

more sustainable. This is achieved through a mix of practices that combine social, environmental, and economic advantages. Table 1 summarizes the ecological and social benefits of well-managed, intensive grazing systems. Further discussion of the social, eco

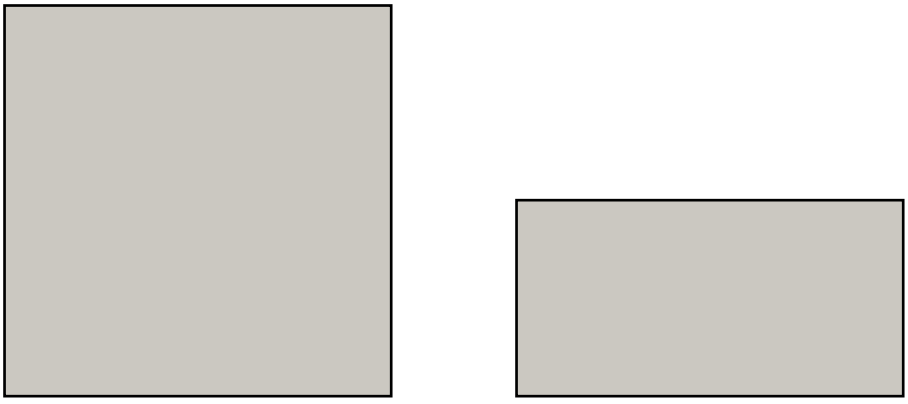
Feed So ce		Confinemen feeding					
Ecological/ ocial effec							
	Little time devoted to managing herd	Planting, harvest, storage, and daily feeding required					
	Animal stress, soil ingestion, parasite ingestion possible	Confinement: hoof and leg problems, acidosis, udder health, animal stress possible					
	Compaction, erosion, reduced OM, reduced permeability likely	Wheel compaction when s					
N ien c cling	Nutrient hot spots. Nutrient deficiencies elsewhere. Nutrients may exceed plant needs on long-term overstocked pastures						
	Most are perennial, but annuals tend to invade. Re-establishment often needed						
	Runoff and loss of sediment, nutrients, organics, and pathogens likely	yents					

	Less than soil potential; unpalatable or low producing species increase. Quality high on close grazed pastures. Spot grazed or zone grazed pastures have variable quality	High quality but more variable than other harvested forage. Lower production than other harvested forage. Stand loss occurs sooner					
-	Fresh manure less offensive than stored manure. Manure build up around haybunks and near shade	Confinement: Concentrated animals and stored manure produce strong odors					
-	Significant supplemental feeding or return to confinement required. Manure spreading energy costs are low. Futile reseeding efforts take energy	Energy costs associated with tilling, planting, harvesting, fertilization,					

Pastures along with woody perennials can add an element of landscape diversity to row-cropped land. Wildlife that use grassland habitat or edges between land cover types are favored. Figure 7 shows how songbird numbers increase as pastureland and other perennial habitats are restored on a quarter section of farmland (Best et al. 1995). The perennial nature of most well-managed pastures reduces the need for soil disturbance and external chemical inputs. The diversity of soil flora and fauna also increases because of increased organic matter and decreased soil disturbance and farm chemical inputs.

Finally, a grazing-based system has marked advantages for animal health when compared with confinement. Dry cows get more exercise, which can facilitate calv

Effect of agricultural landscapes on nesting bird species (modified from Best et al. 1995)



Part II

Considerations for implementing a grazing-based dairy system

Farmers need to clearly understand their economic goals, whether they propose to start up a dairy or remain in the dairy business. How many hundredweight of milk are needed to produce the desired net return to meet principal and interest payments and other costs of running the farm? For the start-up grazing farm, this analysis may be simple because investment can be limited at the outset to purchase only the absolute essentials in equipment, cows, and land to get started. It may mean renting for a while to keep capital costs down. Existing confinement dairy farms that carry holdover debt from machinery and facilities, may find transitioning to grazing more difficult. However, selling unneeded machinery, equipment, and other items can help lower debt principal, making payback easier.

Another economic consideration will be the transition from cropland to pasture. This transition requires substantial time and reinvestment in fences, forage seed, lanes, and watering facilities. Whatever the case, planning for the possibility of low milk prices that would make it difficult to meet all cash flow needs is imperative. Then, determine what other outside income sources are available to meet this low milk price contingency. Farm expenses must be satisfied before discretionary family living expenses. A planning horizon of at least 3 years is needed to project income, expenses, and cash flow if major changes are to be implemented.

Marketing—A marketing strategy is essential for economic success when starting or changing to a grazing-based dairy business. Some fundamental questions to consider are:

- What kind of milk market is already in the area?
- Can you sell to either the fluid milk market or a processing milk market?
- How many processors within hauling distance are willing to buy and pick up your milk?
- On what basis is the milk priced (butterfat, solids, protein, and volume)?
- Are specialized milk market opportunities available for milk produced in a pasture-based system?

Direct marketing may be an option for some. It may use much of the extra time gained by going to a

ule. Also, some breeds and individual cows within breeds may be difficult to maintain in a seasonal system because of lower estrus detection and fertility (Washburn et al. 2002)

- Milk production will be much lower during the transition.
- Will the processor accept milk when the amount of milk supplied daily is more variable?
- Facilities and labor must be available to feed and care for all of the newborn calves simultaneously. Additional laborers may be needed to handle all the cows calving at once.

Ongoing evaluation—Another factor in achieving desired economic goals is ongoing evaluation of changes and analysis of how these changes affect performance outcomes. Some of the more important evaluation tasks include:

- keeping good production records and using a reliable accounting system to track farm performance, preferably on an enterprise-by-enterprise basis
- monitoring quality and quantity of milk produced by its measurable constituents
- monitoring forage quality regularly and adjusting rations accordingly
- monitoring animal health
- monitoring pasture growth at least weekly in all paddocks
- establishing a good advisory team (e.g., veterinarian, nutritionist, economic consultant)

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Grazing animals and pasture plants have co-evolved over time. This plant-animal co-evolutis9pfcuavccuavccuavu(o)25(v)2r(c)25(o)2d(i)25(s9pi(t)25(i)25ETe needed to)TJETEMC /Spa6

- Monitoring milk production and constituents to see how cows are responding to changes in diet quality and climatic conditions. For instance, monitoring milk fat production to ensure the herd is ingesting enough effective fiber for cud chewing.

Applying proper supplementation strategies requires experience. New producers and those thinking about substantial grazing-based dietary changes should work with an animal nutritionist familiar with pasture ration building to ensure the optimal ration balance for the dairy herd at all times.

Forage species selection Proper selection of forage species is needed to ensure that forage is high quality and highly digestible. Guidelines for selecting forage species follow:

- Use a mix of disease-resistant varieties of forage species (4–5, includes legumes) adapted to local soils and climate that will produce adequate forage on-offer during each grazing period throughout the grazing season.
- When different desired forage species do not grow well together because of competition or maturity differences, grow them in separate pastures.
- Use seasonal pastures if forage species can be chosen that grow best at different times of the year and the number of grazing days can be extended by doing so.
- Use species with the best regrowth potential during the grazing season. Offer the cows 80 to 100 pounds of forage dry matter per cow per day in the paddock at turn-in (Muller et al. 2002).

Animal selection Dairy graziers need to select the best artificial insemination (AI) bulls. Bull genetics can be evaluated using the following Animal Improvement Programs Laboratory (AIPL) Web site:

pasture field(s) should be allocated to ensure that just enough vegetation is cut so cows will not be grazing overmature forage at times or regrazing paddocks where forage is too immature and short at other times.

The following design considerations are effective in installing long-lasting serviceable laneways:

- Construct laneways with a relatively flat grade, but allow some elevation change for drainage along the length. Side-to-side drainage can be achieved by crowning the lane or using graded deflectors to collect water and redirect it into a stable grassed area (fig. 11).
- Harden steep or heavily used laneways. A layered, compacted composite of filter fabric cloth (bottom layer), coarse stone or gravel, and fine granular material (top layer) are typical components (fig. 12).
- Maintain laneways regularly to avoid trail ruts that can deliver sediment, nutrients, and bacteria to nearby waterbodies.
- Make sure the topcoat material of laneways is foot-friendly and does not bruise or injure feet.

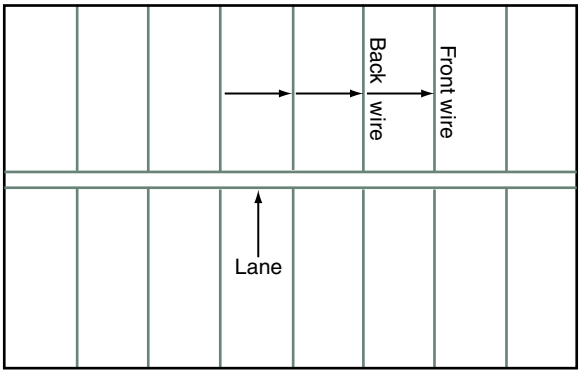
A single, fixed watering site should be avoided when distance to water is greater than 800 feet. Multiple, dispersed water sites ensure that lactating dairy cows do not spend too much time in laneways. Excessive travel time:

- degrades laneways and gate openings
- increases the potential to move nutrients and other pollutants offsite
- increases the potential for nutrient transfer to those areas not needing additional nutrients
- reduces milk production by depressing water and forage intake (cows at a watering facility are unlikely to return to the paddock if far away or during hot weather)
- increases the amount of energy used by the animal for nonproductive activity (walking to/from water), energy otherwise devoted to foraging or lactation

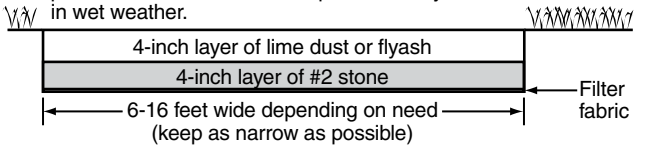
The equipment necessary to hook up a portable water trough is readily available and inexpensive. A pressurized delivery system is best for portable troughs. Troughs should be kept full at all times to keep cows well watered and prevent them from overturning them. Install a pipeline to serve all paddocks. Pipelines can be laid on the soil surface at the lane fence if polyethylene water tubing is used. Burying in a trench is preferred to deliver cooler water and reduce maintenance. However, burying involves a long-term commitment to the layout as it is now. Do not restrict flow by using a narrow diameter pipe. Winterize as needed.

10 Hypothetical paddock layout design

Paddock Layout Design
Large pasture divided down the center length-wise with lane. Paddocks are strip-grazed by moving temporary front wire and back wire across the pasture. Allows for flexible paddock size and easier machinery work.



Laneway Design
Dairy laneways with heavy traffic need surfacing to prevent severe erosion on slopes or muddy conditions in wet weather.



Pastures with live streams in them should have an alternative livestock watering facility to decrease livestock visitation to the streambed and banks. Ideally, these pastures should also be isolated as a separate treatment unit and grazed less intensely, and only under firm soil conditions. This sharply reduces problems associated with water contamination from bed and bank erosion, as well as from manure and urine. Water in ponds and streams can be of questionable quality. An improved stream crossing may be necessary when cows must cross the creek in a streamside pasture or gain access to a set of pastures flanking either side of a stream. Livestock ponds should be fenced and an appropriate grassy buffer established between the fence and pond's edge. If pond water must be used to water livestock, use a siphon hose or gravity flow pipe to convey water to a trough outside the pond fence. These actions improve water quality for receiving bodies and often improve herd health by reducing the transmission of water-borne diseases and parasites through direct udder contact or ingestion. This can contribute to the production of higher quality milk and a healthier herd.

estimate forage production by eye, but it is useful to calibrate the eye with field measurements from time to time. Forage from several random small areas of known size may be clipped, dried, and weighed for accurate yield determination. Visual checks may be inadequate for changes generated by climate or soil conditions because grass stands change in composition and thickness over a grazing season.

Complete records should be kept by individual paddock even when strip grazing. This information can be used to predict in advance how many paddocks are needed and how big they should be.

Monitoring forage quality through regular testing (at least every 2 weeks or when forage species or quality is noticeably different) aids in formulating a proper feed ration. Proper ration balancing is needed to keep milk flow and constituents at their best for the season and lactation cycle of the herd.

To keep grazing cows at the body condition score (BCS) appropriate for the portion of the lactation cycle they are in, their BCS must be monitored throughout the cycle. Body condition is extremely important at breeding to keep the cow on a 12-month calving cycle. Using the dairy cow BCS scale of 1 to 5, they should freshen (calve) with a BCS of 3+ to 4– (Wildman et al. 1982). Pastured cows tend to be trimmer and will score lower than this at 3 or slightly less (Washburn et al. 2002). They should lose no more than 1 BCS during early lactation to avoid ketosis and rebreeding difficulties (Mahanna 1998). The following Web sites may provide additional information on BCS:
http://cahpwww.vet.upenn.edu/dairy/bcs.html
http://www.dasc.vt.edu/extension/nutritioncc/ELANCO.html

Monitor dry matter intake—Cows generally reach maximum daily intake 10 weeks after freshening (calving). At this point, they should be eating 4 percent of their body weight. For every 2 pounds of expected milk production, the cows should eat 1 pound of dry matter. Otherwise, they lose too much body condition and become prone to metabolic disorders. Forage consumption should be at least 2 percent of body weight to assure proper rumen function. Hot weather depresses intake. Temperatures above 75 degrees Fahrenheit cause a 3.3 percent drop in dry matter intake for each 2.2 degrees Fahrenheit increase. Heat stress occurs when temperatures exceed 80 degrees Fahrenheit, relative humidity exceeds 80 percent, or the two combined exceed 140 (Mahanna 1998).

In warmer regions, mid-day shade is needed to maintain intake (West 1995). Either provide portable shade in pastures or keep the milking herd off pasture and furnish stored feed under cover during the heat of the day. Pasture the herd at night when air temperatures are cooler. If possible, paddocks with natural shade areas should be rotated to avoid excessive nutrient accumulation in any one area when heat and/or humidity are extreme.

Monitor milk production—Ideally, milk production should be monitored for individual cows. If this is impossible, then farmers should monitor the bulk tank at end of each milking. Chart milk production and compare it with a normal chart for your region, dairy breed, and rolling herd average. Instructions on how to chart milk and use milk charts is in Dairy Production and Management Benchmarks, University of Georgia College of Agriculture and Environmental Sciences Extension Publication B1193 (Smith et al. 2002).

Monitor milk quality—Milk protein-to-fat ratios should be near 0.9 for Brown Swiss and Milking Shorthorns, 0.85 to 0.88 for Holsteins and Ayrshires, and near 0.8 for Guernseys and Jerseys. Higher values may indicate a fat test problem. Lower values may mean protein test problems from too much fat, or too little total or undegraded protein in the feed ration. Make sure the ration has enough effective fiber to produce a desirable fat test (Mahanna 1998). Lush cool-season grasses often do not have enough effective fiber if they test lower than 35 percent neutral detergent fiber (NDF). Fresh grass fiber is readily fermented in the rumen so only 40 to 50 percent may be effective (Kolver 2001).

Summary

A grazing-based dairy system can be a profitable alternative to a confinement dairy system (Jackson-Smith et al. 1996; Kriegel 2000; White et al. 2002). It requires a different skill set for the manager that involves managing and feeding a live, standing crop of forage rather than a forage crop that is cut, cured or fermented, and stored before feeding. Transitioning to a grazing-based system takes time, knowledge, patience, and experience. Find an experienced grazier or pasture group that can give advice or examples to follow at the outset. Attend grazing conferences where dairy grazing is a part of the program. Focus on accepted and tested practices that optimize livestock performance while sustaining the quality of the natural resources of the farm, watershed, and airshed.

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Part III

Case studies

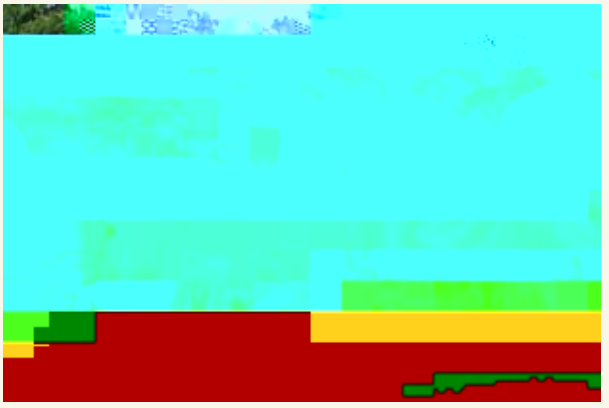
Six case studies of farmers who have successfully implemented grazing-based dairies begin on the next page. These dairy farms span the Nation showing that any dairy farm situation can make grazing work. A commitment is required to make pasture the primary feed source and land use near the milking facilities. Pasture should be treated as a crop and as a feeding and housing facility. This means:

- keeping tabs on its soil fertility needs
- meeting soil test recommendations
- removing excess water
- providing irrigation water in more arid parts of the Nation
- scheduling harvests with at least as much care as if it were an alfalfa field
- creating an infrastructure in the pasture (fences, gates, water troughs, laneways, and perhaps shade structures) as is done with confinement operations at the farmstead to feed, water, and house livestock

Each of the six different farms takes a different approach to grazing-based dairying. This is because of the uniqueness of the individual or partners operating each farm and the uniqueness of the soil, water, and climatic resources each farm is faced with. All of them find it a rewarding experience.

1

Case Study 2—Sullivan Family Dairy



Kevin and Amy Sullivan

Kevin, Amy, and their children, Sara and Brian

Carthage, Northern Lewis County, New York

USDA–NRCS
Lowville Service Center
P.O. Box 9
Lowville, NY 13367
(315) 376–7021

210 Total

100–120

( )
Holstein, Jersey-Holstein cross

5

40

17,000 lb/cow/yr

15

Pasture management
Grazing system
Challenges and advantages

The Sullivan family dairy farm is a seasonal grass-based dairy system located in a part of northern New York known for its long, cold winters and where snowfalls are often measured in feet. Despite the length and harshness of winter in this area, the moderate summer temperatures and generally adequate rainfall make the Tug Hill region nearly ideal for the production and utilization of perennial grasses.

The Sullivans began dairy farming with a conventional tie stall barn where the cows were fed in confinement the year round. However, because of the high production costs and labor associated with this type of feeding program, they soon began to look for a more cost-effective and less labor-intensive means to produce milk. In 1987, they turned their herd out to graze.

The Sullivans currently graze their 65 Holstein and Jersey-Holstein cross cows using a seasonal approach to milk production. The herd is spring freshened so that peak milk production coincides with the availability of the greatest amount of high-quality spring pasture. During the grazing season, milking is done twice a day in a homemade six-unit, step-up milking parlor. The entire herd is dried off during February and March.

This approach allows the Sullivans to produce the greatest amount of milk for the lowest cost during the summer months and reduce their winter feed costs by feeding only a low-cost maintenance ration to their herd during the drying-off period. It also allows them to take the 2 months off from milking.

The Sullivan's pastures consist mostly of orchardgrass-clover or orchardgrass-alfalfa mixtures with a small amount of perennial ryegrass. They are frost seeded with clover almost every spring. The primary hay fields are reseeded about every 6 years. Fertility is maintained using liquid manure from storage. All pastures are mowed at least once per season to control weeds and to eliminate vegetation that has become overmature. Little commercial fertilizer is used.

In a normal year, Kevin and Amy find they can graze their herd for nearly 6 months. The grazing season begins late in April or early in May and winds down by the end of October. The grazing system is constructed using a combination of electrified, high-tensile strength, smooth wire to form perimeters and polywire to create individual paddocks. The cows are generally moved to fresh grass three times a day. In addition to the pasture, each cow receives about

12 pounds a day of a supplemental total mixed ration (TMR) consisting primarily of high-moisture shell corn and rolled oats. If drought limits pasture growth, chopped balage is fed along fencelines. Spring and fall transitions are accomplished by slowly decreasing or increasing the amount of TMR fed corresponding with pasture growth and forage availability. Some balage is also fed during the fall as pasture growth begins to slow.

The furthest paddock from the barn is a 20-minute walk for the herd or between a half and two-thirds of a mile distant. To keep the herd grazing once they get to a pasture, water is pumped from the barn through either 3/4- or 1-inch plastic pipes to portable tanks in each paddock. Kevin notes that while he occasionally sees a cow with a sore foot, herd health is generally excellent. As evidence of this, Kevin points out he has some 8-year old cows in his herd. This means that instead of culling cows because of problems, he has the opportunity to sell cows and heifers at a profit. Veterinary costs, including vaccinations and dry cow treatments, average $16 to $18 per cow per year.

Kevin is quick to point out that "grazing is not easy and is not a magic bullet. It works for people who are willing to take the time to make it work. However, it takes thinking and dedication to stick with it until you learn and understand the process. It takes more management than conventional dairying." He cites his biggest problem is keeping track of his feed supply. "Guessing what the weather is going to do to forage yield and quality is not easy. However, you get back what you put into it."

Kevin suggests that grazing has allowed them to handle 65 cows with about the same amount of time and effort that it took them to handle 40 when they were a conventional dairy. Furthermore, Kevin concludes, "they can make a good living without pushing the cows' production." This in turn allows the cows to last longer and breed back sooner. Being seasonal means that April, May, and June are extremely busy on the Sullivan farm. However, the winter months are so enjoyable for the Sullivans, especially February and March, that Kevin states, "they would never go back to milking cows the year round."

In addition to improving the quality of their lives and the lives of their cows, Kevin also points out both the environmental, as well as economic benetuneWhe

While seasonal grass-based dairying is not suitable for every dairy farm or dairy producer, for the Sullivans it is the perfect blend of lifestyle and standard of living. Also, milk processing plants in their area are less concerned about fluctuations in milk production at the farm caused by all the cows in a seasonal calving herd being nearly in the same number of days in lactation.

"It is not easy, it is not just a job, it is a way of life."

Kevin Sullivan

Case Study 3—Mallonee Dairy

Mallonee Dairy is owned and operated by Maynard and Kim Mallonee along with their parents, John and Mary, and son, Jack. The Mallonee Dairy is a transitional-organic grazing dairy located in Lewis County in western Washington. The dairy is home to approximately 65 Holstein cows and 60 heifers. Of the 215 acres on the farm, 90 acres are pasture for grazing dairy cows.

Grazing has been a tradition on the Mallonee Dairy for several generations, and they plan to continue grazing in the future. According to Maynard, maintaining a high level of milk production has been one of the greatest advantages of grazing. In addition, the Mallonees feel that grazing has played an important role in preventing cow health problems and increasing cow longevity.

The Mallonee Dairy is an organic dairy. The land has been certified organic for several years. Organic dairying assures the Mallonees that they are decreasing health concerns for their animals as well promoting a safe product for consumers. Although the Mallonee Dairy was always close to being organic, economic considerations led them to seek certification to sell their product as organic.

To diversify farm income, Mallonee Dairy also supports a small organic beef cattle enterprise. The beef enterprise combines easily with the grazing system already present for the dairy cattle and is an additional enterprise for the farm. It includes breeding stock and organically raised, grass-fed steers.

Overall, few health problems are seen on this dairy. The health problems of greatest concern are milk fever occurrences in early spring when cows are moved to pasture and an occasional case of foot rot if conditions become wet and muddy.

The grazing season lasts from around May 1 to November 1. The lactating cows are on a management intensive grazing program and are moved to a new strip of pasture at least once a day. In spring when grass growth is lush, cows are moved to a new strip of pasture on a daily basis. As the grass growth slows in summer and fall, cows are moved twice a day to provide adequate amounts of grass. Each pasture is grazed four to five times per year. The grazing season is limited by soil saturation resulting from the high rainfall during the winter. In contrast to the lactating cows, heifers are on a rotational grazing system and are moved once every 3 or 4 weeks throughout the summer months.

The pastures are located less than a quarter mile from the milking parlor and have a terrain that is fairly flat. Moving the cows from pasture to the milking parlor takes about 15 minutes. Once in the milking parlor, cows receive a grain supplement while they are milked. During the grazing season, lactating cows are given 25 pounds of grain per day. Besides the grain, cows are supplemented with a mixture of salt and trace minerals, which they have access to while they are grazing. Water is made available through a hose and trough system that is moved with the cows from pasture to pasture. Water accessibility is one of the main factors that prevent the grazing pastures from extending further from the milking facility.

Forage supplementation begins in October to help transition cows into a winter-feeding system that includes preserved forages. During the winter months, cows are housed in a freestall barn where they are fed a combination of forage harvested from pastures and purchased hay.

Pastures are maintained in native (i.e., commonly occurring, but mostly introduced species that have naturalized) forage species and are not replanted on a regular basis. Tall fescue is the main grass species though a variety of other grass species occur, and several pastures are approximately 25 percent clover. In the spring, grass species overtake the clover, thus the best clover growth occurs after the first cutting of grass has been removed from the pasture. Pastures with sandy loam soil are the first pastures grazed each spring because they dry faster than those with more clay in the soil. The Mallonee Dairy has not had any particular problems with weed species. Grazing and clipping the pastures appears adequate to control weeds.

In addition to grazing, pastures are mechanically harvested at least once a year and may be harvested a second or third time if weather conditions allow. Harvested forage is stored as dry hay or wrapped silage bales and used as a feed source during the winter.

During the summer months, pastures are irrigated after cows finish grazing and are moved to another pasture. The irrigation system is a hand-line sprinkler system that is manually moved from pasture to pasture. Bs m(ture. 0 10 300.7273 629.05 Tm[a sO10 0cows fii1ujEinkler)T

advises farmers contemplating a grazing-based system to get to know their grasses and learn to manage what they have. "Native (naturalized) grasses are there for a reason—because they work best," he says.

Young Ward Farm is a quarter-mile wide and three-quarters-mile long, with an alley down the center. Gates and water troughs are located about every 300 feet along the alley. Portable fences that allow access to one or two water troughs are moved every 12 hours so that the cows receive new pasture after every milking. A grain supplement and minerals are fed in the barn as the cows are being milked. These are supplied by the local grain elevator.

A quarter of the farm is flood irrigated every week so at least half of the fields are accessible to grazing at any one time (allows the irrigated ground to dry for 1–2 weeks). Grazing is timed to avoid conflict with the irrigation schedule.

Soil tests have shown phosphorus and potassium to be adequate, but not excessive in the pastures. Fields are generally fertilized with nitrogen once in early spring and again during the summer. What little manure is produced in the barn during the summer is stockpiled and applied to the fields in the fall. Manure collected over the winter is applied in the spring before grazing begins and usually before green-up. Manure contamination of feed has not been a major issue when manure is applied in this fashion.

The biggest pest problems the Wangsgards have encountered have been biting flies, mosquitoes, and weeds. The flies and mosquitoes result (they expect) from the farm's location in bottomlands where they thrive. Grazing probably does not exacerbate the problem. Weed pressures are most severe in new pastures, so weed control is critical during establishment. In mature pastures, barley headed foxtail and thistles are the worst weeds. Spot spraying is used to control thistles. Irrigation ditches that harbor barley headed foxtail are sprayed before the grass heads out and when ditch is empty of water.

The advantages of this system over confinement dairies include cheap feed, healthier cows, and reduced labor. As the farm is largely a family run business, labor savings are important. Cost savings are also important. Mike points out that, "Whatever you put into a cow produces a return in milk, but the return diminishes depending on the input." Water is the most cost-effective input you can supply. Next is alfalfa grass, and finally grain. In this part of Utah, adequate water and forage produce approximately 45 pounds of milk per animal day. Grain produces another 5 pounds per day. Whether a major grain supplement is justified depends on the price of milk and the price of grain.

Case Study 5—Buck Shand

Buck and Dorothy Shand

:
Dallas County, Alabama

:
USDA–NRCS

Buck Shand and his wife Dorothy have a 1,650-acre farm in Dallas County in central Alabama. Two hundred acres of the farm is devoted to dairying. Buck has been around the dairy business his entire life. He began the transition from confinement to a grazing-based system in the mid 1990s when it became apparent that the price of milk was not keeping up with inflation and quality labor was becoming difficult to find. Based on fairly detailed recordkeeping, he realized he needed to cut costs to stay in business. Dallas County is in the black belt of Alabama where the dominant soils are heavy black clays and rainfall is usually plentiful. This is ideal grass-growing country—perfect for grazing. Buck looked backward to the time when most farmers were grazing their dairy cows and forward to a grazing system developed in New Zealand, and decided to convert to a grazing-based dairy system.

To get started, pastures had to be developed and fencing, laneways, and watering facilities were needed, but a lot of equipment could be retired. One step in the transition was to start breeding the Holstein herd with Jersey bulls. Jerseys are a smaller breed than Holstein. On grass the two breeds produce about the same amount of milk. Breeding smaller animals that consume less feed seemed a logical step.

The dairy has four pastures that are subdivided by permanent and portable electric fencing. Water is provided for each pasture. Laneways have drainage tile to keep them from becoming muddy. Pastures are rotated daily. Each pasture is rested for 30 to 45 days after being grazed. In the spring when grazing cannot keep up with the lush growth, pastures are mechanically harvested and saved for use later when dry matter is low.

The primary forage crops on the dairy are dallisgrass, white clover, Persian clover, and several hardy fescue varieties with beneficial endophytes. The clovers and dallisgrass grow naturally on the farm, but Buck is planting the fescue over time and eventually hopes to have 200 to 300 acres of fescue pasture (some of which may be used by the beef cattle). The forage species are seasonal. White clover is a winter perennial that is grazed early and sets seed by mid June. Persian clover is an early annual that grows during most winter months. The fescues are cool-season grasses that do best early in spring and late in fall. Dallisgrass is most active in the summer months. This variety of forage crops permits grazing 10 months of the year.

Pastures are fertilized strictly according to soil test recommendations and rarely need any additions except phosphorus. During drought, feed is supplemented with cottonseed to prevent overgrazing. In the barn, cows are also fed soy hull pellets.

One of Buck's challenges is weeds in the pastures. Buttercup in the spring and camphorweed, ironweed, and cocklebur in the summer are some of the main problems. These generally can be controlled with 2,4–D when necessary. Wild onion in winter pastures can affect milk flavor. To avoid this problem, cows are taken off winter pasture 2 hours before milking.

A

The cows on Buck Shand's dairy farm are generally very healthy. As long as the cows are kept out of the mud, mastitis and other health problems have been minimal. The pastures are rotated daily using electric fencing to keep the cows out of the mud. Drainage tile has also been placed under areas that tend to pond water.

Cows are milked twice a day in a double-4, straight-through milking parlor. "It's old, but effective," says Buck. With this system 8 cows can be milked every 10 minutes. Travel time from the pastures to the barn is about 15 to 20 minutes. Cows tend to remain productive for 5 lactations. The average number of lactations per cow in this part of Alabama, according to a University report, is 1.5.

Animal waste management has become relatively

The paddocks are typically managed as follows. New forage is no-till planted into each paddock where the recently grazed crop is no longer productive. After the cows move off, any remaining ungrazed pasture is cut and baled for dry cows and heifers. The timing of each task depends on weather, maturity date of the crop, and how much the cows graze the paddock during the growing cycle. Knowing the crop maturity date is critical to the management system. Different forage crops mature at different rates, and once they mature their value for grazing is diminished. The exception is alfalfa, which maintains its nutrition throughout its life cycle. Tom's rule of thumb for the pasture is to graze when the crop is below the knee and bale when it is above the knee.

The forage crops planted on Trantham Dairy Farm include corn (grazing maize), trudan, millet, small grains, alfalfa, and clover. Tom continues to experiment with forage crops, looking for crops with the right vigor, nutrition, and growing season to improve the grazing system. He uses a notebook to keep track of the planting and grazing schedule. He monitors the soils regularly for nutrient imbalances and applies lime periodically to offset the export of calcium in the milk. He also monitors the forages closely to determine the need for supplemental feeding. Tom estimates that currently about 50 percent of the cows' nutrients come from supplemental feeding, though a lot depends on the weather.

A

Most of the paddocks have some natural shade. In hot weather, early morning grazing is scheduled in those paddocks without shade.

Cows are watered from 300-gallon Rubbermaid® troughs on geotextile pads in each paddock. A 40-foot-long watering trough is also supplied along the path as cows leave the milking parlor. Tom is experimenting with a variety of materials for his laneways, which need to be mud-free for animal health.

Manure is scraped daily from the cement milking and feeding areas. Solids are separated out and spread on pastures weekly using a calibrated side-opening spreader. Cows are kept off freshly manured paddocks for 5 to 25 days. The wastewater is stored in the waste lagoon along with wash water from the milking parlor. The trench silo currently holds well water. A suction hose and gate valves connect the two reservoirs and allow for mixing. Newly planted or freshly grazed paddocks receive more manure and less water. During droughts, paddocks receive more water and less manure. Of the 25 paddocks, 16 are fitted with an irrigation system that carries water underground from the trench silo/waste lagoon. The system is currently being expanded to collect all runoff water from the farm and store it in a newly constructed reservoir that can be pumped back to the paddocks.

Tom shares his experiences with other dairy farmers considering transition to grazing. "I believe the farmers of today have the responsibility of leaving things in better shape for the next generation of farmers," he says. "What I've learned would go to waste if it stopped with me." He recommends the first step in a transition is to "get the herd grazing." A good place to start in his region might be to plant a winter grazing crop, such as rye, after the corn harvest. Milk production may initially drop, but TMR costs immediately go down, and over time production should increase as the system develops. As profit margins increase with each transition stage, more improvements can be made, but the job is never done. "That's the beauty of this kind of dairying," says Tom. "Every day you wake up with more ideas you want to try."

**Information for this case study was gathered from a former web site before the current updated and expanded one listed here: http://www.southernsare.uga.edu/twelve/trantham.html with permission from Tom Trantham.*